

DQO Step: 1	Medium:	GMR Sediment		Quarry Pond (QP) Sediments	
	Investigation Phase:	Phase 1A	Phase 1B	Phase 2	Phase 1C
	Investigation Item:	Comparison to Human Health and Ecological Screening Values	Comparison to Upstream Conditions	Benthic Sampling	Comparison to Human Health and Ecological Screening Value
	<u>State the Problem</u>				
	i) Problem description	It is unknown whether the Site has a measurable impact on sediment quality in the GMR. Previous Great Miami River (GMR) sampling found PAH concentrations and some pesticide concentrations greater than conservative ecological screening levels, and arsenic and PAHs concentrations greater than USEPA residential soil RSLs. However, these common contaminants were also found, in similar concentrations, in upstream samples taken by OEPA (1995) in routine sampling of the GMR. Therefore, further data are needed to assess whether downstream concentrations are greater than upstream concentrations and, if so, whether downstream samples pose potential risks to ecological and human receptors.		If contaminant concentrations are greater than sediment benchmarks protective of aquatic life (Phase 1A), significantly greater than upstream concentrations (Phase 1B), and are potentially Site-related, a benthic community survey will be completed in accordance with USEPA Rapid Bioassessment Protocols (EPA 841-B-99-002) or OEPA assessment methods.	
ii) Planning team iii) Conceptual model	See note at bottom		See note at bottom		
	- Shallow groundwater from the Site typically flows towards the west and/or north towards the GMR, which could carry contaminants into its sediment. - Contaminants in sediment can be toxic to benthic organisms. -Fish may uptake contaminants in sediments and can be eaten by other fish, birds, and humans.		- Shallow and deep groundwater from the Site typically flows towards the west towards the QP, which could carry contaminants into its sediment. - PAH concentrations greater than conservative ESLs, and arsenic and PAH concentrations greater than USEPA industrial soil RSLs, have been found in QP sediment.		
	- Erosion of surface soils from the Site could also carry Site-related contaminants to the GMR and/or the QP, which is at a lower elevation, via overland surface flow. - During flood events, off-site contaminants could be deposited on-site. -Contaminants could be toxic to benthic organisms and impact other species in the aquatic ecosystem. - Persons use the GMR and QP for recreation, mainly in boats; however, they could come into dermal contact with the sediment. - Persons consume the fish caught in the QP.				

iv) General intended use for data	<p>The sediment data collected will be compared against Ecological Screening Values (ESLs) to assess whether aquatic ecosystem health is potentially impaired.</p> <p>The sediment data will be used to determine if bioaccumulative contaminants are present and to model edible fish concentrations for the HHRA.</p> <p>Additionally, CRA will compare the data to USEPA Residential Soil criteria as a screening evaluation to identify potential human health risks.</p> <p>The data collected will ultimately be used in the Baseline Risk Assessment for OU2.</p>	<p>The data collected from sampling locations adjacent to the landfill’s boundaries will be compared to upstream conditions, to determine if there are any measurable inputs of contaminants from the Site.</p> <p>The data collected will ultimately be used in the Baseline Risk Assessment for OU2.</p>	<p>The data collected will be used to detect aquatic life impairments and assess their relative severity.</p> <p>The data collected will ultimately be used in the Baseline Risk Assessment for OU2.</p>	<p>The data collected will be compared against ESLs to assess if QP aquatic ecosystem health is potentially impaired.</p> <p>Additionally, CRA will compare the data to USEPA Residential Soil criteria to identify any potential human health risks.</p> <p>The data collected will ultimately be used in the Baseline Risk Assessment for OU2.</p> <p>The data will be used to determine if there is a need to cap or otherwise remediate the sediments in the QP.</p> <p>The sediment data will be used to determine if bioaccumulative contaminants are present and to model edible fish concentrations for the HHRA.</p>
v) Resources, constraints, deadlines	Sufficient resources will be committed to sample sediments under the OU2 RI/FS work plan.			Sufficient resources will be committed to sample sediments under the OU2 RI/FS work plan.

2 Goals of the Study:

i) Primary study question	<p>Does sediment in the GMR and/or QP contain Site-related contaminants at concentrations greater than ESLs and/or Residential soil criteria for protection of human health?</p>	<p>Does the Site add significantly to contaminants in sediments in the GMR adjacent to and down-gradient of the Site?</p>	<p>Are benthic organisms at risk due to sediment concentrations caused by Site-related contamination?</p>	<p>Do sediments in the QP contain contaminant concentrations greater than ESLs and/or Residential soil criteria for protection of human health?</p>
ii) Alternate outcomes or actions	<p>- If sampling demonstrates that contaminants in sediment are less than screening levels/criteria, no further sampling is planned.</p>	<p>- If sampling demonstrates conditions adjacent to the Site are less than or equal to those found upstream, no further sampling is planned.</p>	<p>- If the community survey demonstrates that aquatic life in the GMR is not affected by Site-related contaminants, no further sampling is planned.</p>	<p>- If sampling demonstrates that contaminants in sediment are less than screening levels/criteria, no further sampling is planned.</p>

iii) Type of problem (decision or estimation) ¹ iv.a) Decision statement	- If sampling demonstrates that contaminants are present at concentrations greater than screening levels/criteria, and that contaminant concentrations are greater than upstream conditions (see Phase 1B to right), further evaluation and/or remedial measures may be warranted.	- If sampling demonstrates contaminant concentrations are greater than those upstream, and that contaminant concentrations are greater than Action Level criteria (see Phase 1A to left), further evaluation and/or remediation may be warranted. Further evaluation may consist of an ecological study (i.e., benthic community study; see Phase 2 to the right).	- If the community survey demonstrates that Site-related contaminants impair aquatic life in the GMR and/or the QP, further evaluation and/or remedial measures may be warranted.	- If sampling demonstrates that contaminants are present at concentrations greater than screening levels/criteria, further evaluation and/or remedial measures may be warranted (i.e., acute bioassays on representative QP sediments).
	Decision (Action Level)	Decision (Action Level)	Decision (Action Level)	Decision (Action Level)
	Determine whether any contaminant concentrations are greater than ESLs, or if the sum of Equilibrium Partitioning Sediment Benchmark Toxic Units ($\sum \text{ESBTU}_{\text{FCV}}$) > 1, or if the organic carbon normalized excess Simultaneously Extracted Metal ($\sum \text{SEM}$) > 150 $\mu\text{mol/g}_{\text{oc}}$ in the GMR sediments near the Site, or if the concentrations of arsenic are greater than its Probable Effects Concentration (PEC).	Determine whether any measurable input of contaminants from the Site, relative to upstream conditions, occurs in the GMR sediments near the Site.	Determine whether any measureable impact to aquatic life in the GMR occurs due to contaminants from the Site, relative to upstream conditions	Determine whether any contaminant concentrations are greater than ESLs, USEPA Residential soil criteria, Sum of Equilibrium Partitioning Sediment Benchmark Toxic Units ($\sum \text{ESBTU}_{\text{FCV}}$) > 1, or organic carbon normalized excess Simultaneously Extracted Metal ($\sum \text{SEM}$) > 150 $\mu\text{mol/g}_{\text{oc}}$ in the on-Site pond sediments near the Site.
iv.b) Estimation statement & assumptions	--	--	--	--

3 Identify Information Inputs:

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i) Information types needed	Sediment sample analysis is required to assess conditions in the GMR near the Site.		A Benthic community survey may be required to assess the impact to aquatic life in the GMR near the Site.	Sediment sample analysis is required to assess conditions in the QP.
ii) Information sources	- New data from the investigation will form the basis of assessment. The results from three previous sediment samples collected from the GMR and QP, as well as results of soil samples will be considered during interpretation of the data obtained. - Sediment samples will be analyzed for methylmercury, PAHs, divalent metals (copper, cadmium, mercury, nickel, lead and zinc) using AVS/SEM analyses, and total metals (including arsenic).		- New data from the community survey will form the basis of assessment. The results from Phase 1A and 1B (see left) will be considered during interpretation of the data obtained.	- New data from the investigation will form the basis of assessment. The results from previous sediment samples collected from the QP, as well as results of soil samples will be considered during interpretation of the data obtained. Sediment samples will be analyzed for methylmercury, PAHs, divalent metals (copper, cadmium, mercury, nickel, lead and zinc) using AVS/SEM analyses, and total metals (including arsenic).
iii) Basis of Action Level	Action Levels are: - Final Chronic Values (FCV) for PAHs, $\sum \text{ESBTU}_{\text{FCV}} < 1$ - Excess SEM $< 150 \mu\text{mol/g}_{\text{oc}}$ - PEC values for arsenic	The selected Action Level is a Background Threshold Value (e.g., 95th percentile) based on upstream conditions.	Population and community level response will be evaluated.	Action Levels are: - Final Chronic Values (FCV) for PAHs, $\sum \text{ESBTU}_{\text{FCV}} < 1$ - Excess SEM $< 150 \mu\text{mol/g}_{\text{oc}}$ - PEC values for arsenic
iv) Appropriate sampling & analysis methods	Methods are described in the Field Sampling Plan (CRA, January 20110, CRA's Standard Operating Procedures, and the Quality Assurance Project Plan (CRA, September 2008). Organic carbon in sediments will be analyzed using the Lloyd Kahn or Walkley-Black methods. PAH results will be evaluated against $\sum \text{ESBTU}_{\text{FCV}}$, as detailed in USEPA, 2003. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA-600-R-02-013. Divalent metals results will be evaluated against the organic carbon normalized excess $\sum \text{SEM}$.		A benthic community survey will be completed in accordance with USEPA Rapid Bioassessment Protocols (EPA 841-B-99-002) or OEPA assessment methods (OEPA, 1989. Biological criteria for the protection of aquatic life), depending on the habitat.	Methods are described in the Field Sampling Plan, CRA's Standard Operating Procedures, and the Quality Assurance Project Plan. Organic carbon in sediments will be analyzed using the Lloyd Kahn or Walkley-Black methods. PAH results will be evaluated against $\sum \text{ESBTU}_{\text{FCV}}$, as detailed in USEPA, 2003. Procedures for the Derivation of Equilibrium Partitioning Sediment Benchmarks (ESBs) for the Protection of Benthic Organisms: PAH Mixtures. EPA-600-R-02-013. Metals results will be evaluated against the organic carbon normalized excess $\sum \text{SEM}$.

i) Target population, sample units	<p>The target population is the upper (available) layer of sediments (2 - 4 inches below sediment/water interface) in the GMR adjacent to the Site. The sampling units are individual grab samples collected from the near-Site reaches of the GMR. Depositional areas will be targeted for sediment sample locations. Sediment samples will also be collected in depositional locations immediately downstream of any point discharges identified between the upstream dam and the southern Site boundary.</p>	<p>The target population is the upper (available) layer of sediments (2 - 4 inches below sediment/water interface) in the upstream sampling locations. The sampling units are individual grab samples collected from the upstream reaches of the GMR. Depositional areas will be targeted for sediment sample locations. Sediment samples will be collected in depositional locations immediately downstream of any point discharges identified between the upstream dam and east of the Dryden Road bridge.</p>	<p>The target population is the aquatic life in the GMR in the vicinity of the Site. The sampling units are composite samples collected from the GMR, divided by upstream, near-Site, and downstream reaches. Sampling efforts may be concentrated in near-shore habitats, where most species will be collected.</p>	<p>The target population is the upper (available) layer of sediments (2 - 4 inches below sediment/water interface) in the QP. The sampling units are individual grab samples collected from the QP. Depositional areas and areas where visual evidence of potential leachate migration is observed will be targeted for sediment sample locations.</p>
ii) Specify spatial boundaries	<p>Near-Site sampling locations are those occurring to the west of the Dryden Road bridge (i.e., as surface water passes the Site), and these will be located on the near (south and east) shore of the GMR. Sediment samples will be collected from the top of the sediment layer (i.e., 2 - 4 inches below the sediment/water interface) in the GMR.</p>	<p>Upstream sampling locations are to the east of the Dryden Road bridge. Sediment samples will be collected from the top of the sediment layer (i.e., 2 - 4 inches below the sediment/water interface) in the GMR.</p>	<p>Upstream sampling locations are to the east of the Dryden Road bridge. Near-Site sampling locations are those occurring to the west of the Dryden Road bridge (i.e., as surface water passes the Site), and these will be located on the near (south and east) shore of the GMR. Downstream sampling locations are to the south of the City of Dayton Wastewater Treatment Plant.</p>	<p>Sediment samples will be collected from the top of the sediment layer (i.e., 2 - 4 inches below the sediment/water interface) in the QP.</p>
iii) Specify temporal boundaries	<p>The temporal boundaries are indefinite, assuming continued exposure at levels found during sampling. The practical temporal limits are based on exposure assumptions forming the basis for the Action Levels.</p>			<p>The temporal boundaries are indefinite, assuming continued exposure at levels found during sampling. The practical temporal limits are based on exposure assumptions forming the basis for the Action Levels.</p>
iv) Identify any other practical constraints	<p>Sampling may be postponed due to flooding or iced conditions in the GMR. If any dams/weirs are encountered, samples will be collected from the side of the dam closest to the Site (i.e., downstream of any upstream dams, and upstream of any downstream dams).</p>			<p>Sampling may be postponed due to flooding or iced conditions of the QP.</p>

v.a) Scale of inference for decision making v.b) Scale of estimates	Comparisons to Action Levels will be carried out on an individual-location basis.	Comparisons to upstream conditions will be carried out on an individual-location basis.	Criteria in biological indices will be used to evaluate the impacts on aquatic life.	Comparisons to Action Levels will be carried out on an individual-location basis.
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